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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/945,241	08/31/2001	Fumiaki Matsushima	93191-000277	1301
27572	7590	04/01/2004	EXAMINER	
HARNESS, DICKEY & PIERCE, P.L.C. P.O. BOX 828 BLOOMFIELD HILLS, MI 48303			NGUYEN, HA T	
			ART UNIT	PAPER NUMBER
			2812	
DATE MAILED: 04/01/2004				

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/945,241

Applicant(s)

MATSUSHIMA ET AL.

Examiner

Ha T. Nguyen

Art Unit

2812

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06 February 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3-15,17,18 and 30-49 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1,3,5-14 and 30-39 is/are allowed.
- 6) ☒ Claim(s) 4,15,17,18 and 40-49 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Notice to applicant

1. Applicants' Amendment and Response to the Office Action mailed 9-8-3 and Request for a Continued Examination have been entered and made of record. Following is an Office Action responding to the request.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 4, 18, 40, and 42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Saitoh et al. (EPN 766310A2, hereinafter "Saitoh ") in view of Chen (USPN 6191023).

[Claim 4] Referring to Figs. 1-8 and related text, Saitoh discloses a method for forming a bump comprising the steps of: forming a resist layer 24 to have through-holes located on pads 32, and forming metal posts 3a or 25 on the pads conforming to the shape of the through-holes so as to have a space between the metal posts for receiving a soldering or brazing material. But Saitoh does not disclose expressly forming holes on a pad. However, the missing limitation is well known in the art because Chen discloses this features (See fig. 1). A person of ordinary skill is motivated to modify Saitoh patent with Chen to obtain better adhesion.

[Claim 40] Saitoh also discloses wherein the metal post comprises first and second metal posts, wherein the first metal post 3a is formed while the resist layer exists, and the second metal post 3b is formed on the first metal post (see Fig. 3).

[Claim 42] Chen also discloses wherein the pad is covered with an insulating film 4, the resist layer 5 is formed on the insulating film, an opening for exposing at least part of the pad is formed in the insulating film after forming the through-hole in the resist layer, and the first metal layer is formed on the pad while the resist layer exists (see Figs. 1-3).

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[Claim 18] Referring to Figs. 1-8, and related text, Saitoh discloses bonding a plurality of metal posts 3a to a lead 11 through a soldering or brazing material 3b, the metal posts formed on pads 22 of a semiconductor chip 1, a space being provided between the metal posts; wherein the soldering or brazing material, when melted, is allowed to flow into the region of each of the metal posts for receiving the soldering or brazing material so as not to spread onto another pad adjacent pad. But it does not disclose expressly the metal posts are formed on a pad. However, the missing limitation is well known in the art because Chen discloses this feature (see Fig. 3). A person of ordinary skill is motivated to modify Saitoh with Chen to obtain reliable bonding with less stress.

Therefore, it would have been obvious to combine Saitoh with Chen to obtain the invention as specified in claims 4, 18, 40, and 42 .

4. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Saitoh in view of Chiu (USPN 6414849).

Referring to Figs. 1-8, and related text, Saitoh discloses bonding a plurality of metal posts 3a to a plurality of leads 11 through a soldering or brazing material 3b, each of the metal posts formed on each of a plurality of pads 22 of a semiconductor chip 1.

But it does not disclose expressly each of the metal posts having a side surface in which is formed a recess for receiving the soldering or brazing material, wherein the soldering or brazing material, when melted, is allowed to flow into the region of each of the metal posts for receiving the soldering or brazing material so as not to spread onto an adjacent pad of the plurality of pads . However, the missing limitation is well known in the art because Chiu discloses this feature (see Fig. 9A, #948 and col. 9, lines 21-64). A person of ordinary skill is motivated to modify Saitoh with Chiu to obtain reliable bonding with less spacing between posts.

Therefore, it would have been obvious to combine Saitoh with Chiu to obtain the invention as specified in claim 15.

5. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Saitoh in view of Ono et al. (USPN 6525422, hereinafter " Ono ").

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Saitoh discloses substantially the limitations of claim 17, as shown above. It also discloses wherein the soldering or brazing material, when melted, is allowed to flow into the sides of each of the metal posts so as not to spread onto an adjacent pad of the plurality of pads.

But Saitoh does not disclose expressly each of the metal posts having a hole exposing the pad.

However, the missing limitation is well known in the art because Ono discloses this feature (See Figs. 3(a, b)). A person of ordinary skill is motivated to modify Saitoh with Ono to obtain smaller and more reliable device .

Therefore, it would have been obvious to combine Saitoh with Ono to obtain the invention as specified in claim 17.

6. Claims 41, and 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Saitoh in view of Chen, as applied above, and further in view of Dion [USPN 5130275].

[Claim 41] The combined teaching of Saitoh and Chen discloses substantially the limitations of claim 41, as shown above. But Saitoh and Chen does not disclose expressly the forming of the second post after removing the resist layer. However, the missing limitation is well known in the art because Dion discloses this feature (See Figs. 7-11). A person of ordinary skill is motivated to modify Saitoh and Chen with Dion to obtain a more accurate control of the size of the spacing adjacent the sides of the metal posts.

[Claim 43] Chen also discloses wherein the pad is covered with an insulating film 4, the resist layer 5 is formed on the insulating film, an opening for exposing at least part of the pad is formed in the insulating film after forming the through-hole in the resist layer, and the first metal layer is formed on the pad in as state in which the resist layer is formed (see Figs. 1-3).

Therefore, it would have been obvious to combine Saitoh and Chen with Dion to obtain the invention as specified in claims 41 and 43.

7. Claims 44-49 are rejected under 35 U.S.C. 103(a) as being unpatentable over the respective combination of the references applied to claims 40 or 41, as shown above, and further in view of Watanabe et al. (USPN 6218281, hereinafter "Watanabe").

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The respective combined teaching of the references applied to claims 5, 6, 40, or 41 discloses substantially the limitations of the related dependent claims 9-14 and 44-49 as shown above.

But each combination of the applied references does not disclose expressly the electroless plating of the first and second metal layers and the materials used for the first and second metal layers.

However, the missing limitations are well known in the art because Watanabe discloses the use of electrolysis plating to form the bump electrode 66 and that the upper interconnect 47b can be formed of Ni (See col. 13 , lines 37-41 and col. 14, lines 3-12).

A person of ordinary skill is motivated to modify each combination of the applied references with Watanabe to use electroless plating for reduction of production cost and to use Ni and Au as materials for the first and second metal layers to obtain better adhesion and better quality.

Therefore, it would have been obvious to combine each combination of the applied references with Watanabe to obtain the invention as specified in claims 44-49.

Allowable Subject Matter

8. Claims 1, 3, 5-14, and 30-39 are allowed.

Claim 1 recites the inner surface of the resist layer having a portion projecting inwardly in the through hole and claim 3 recites the through-hole of the resist layer having a ring shape so that part of the resist layer remains at the center of the through-hole... the metal post has a hole exposing the pad.

These features in combination with the other elements of the claims are neither disclosed nor suggested by the prior art of record.

Claims 5-14 and 30-39 variously depend from claim 1 or 3, they are allowed for the same reason.

Response to Amendment

9. In view of applicants' arguments and the amendment to the claims, the objection to claims 4-14, 19-38, and 40-49 and rejections of claims 1, 5-14, 17 and 18 under 35 U.S.C. 103, as applied in the Office Action mailed 9-8-3, have been withdrawn.

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Applicants' arguments with regard to the remaining rejections under 35 U.S.C. 103 have been fully considered, but they are not deemed to be persuasive for at least the following reasons.

Applicants argued that Saitoh and Chen cannot be combined because they fail to teach a resist layer having holes over the pad, Saitoh uses a resist to form posts while Chen uses a resist to form spaces 7 in a passivating material 4 which yield a grid structure 6. The examiner disagreed, both Chen and Saitoh teach the use of resist layer with holes for patterning in the making of metal posts. They are in the same field of endeavor, hence combinable. The question is whether a person of ordinary skill in the art is motivated to combine the two. The answer is yes, Chen's teaching of forming a plurality of posts on a pad gives the advantage of better adhesion. The expectation of some advantage is the strongest rationale for combining references (MPEP 2144). Therefore, there is a good motivation to combine the two references.

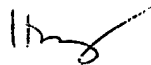
Saitoh in combination with the applied reference do teach or make obvious all the limitations of the claims 4, 15, 17, 18, and 40-49.

Conclusion

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ha Nguyen whose telephone number is (571) 272-1678. The examiner can normally be reached on Monday-Friday from 8:30AM to 6:00PM, except the first Friday of each bi-week. The telephone number for Wednesday is (703) 560-0528.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Neibling, can be reached on (571) 272-1679. The fax phone number for this Group is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0956.



Ha Nguyen
Primary Examiner
03- 30 - 04